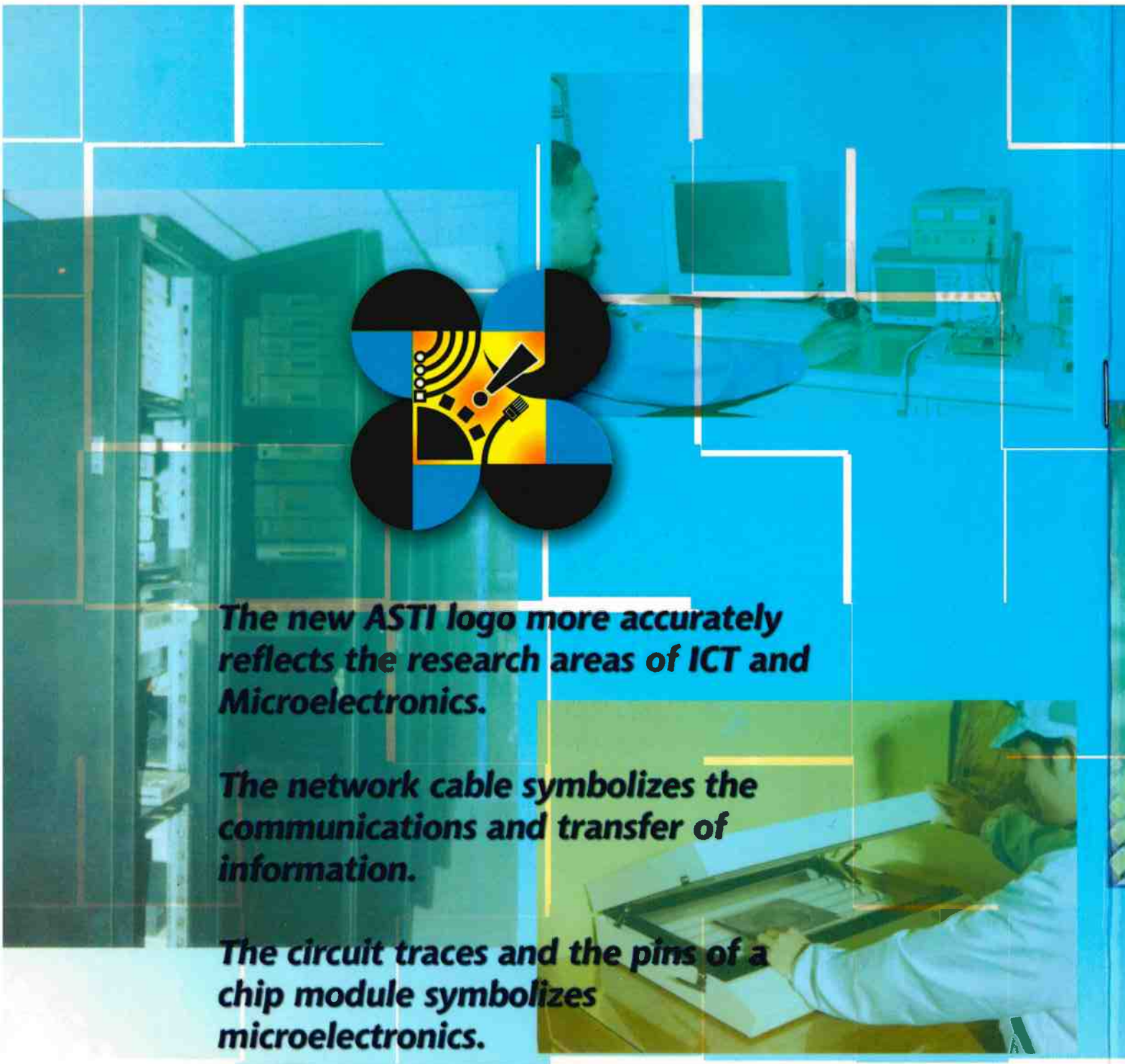

The new ASTI logo more accurately reflects the research areas of ICT and Microelectronics.

The network cable symbolizes the communications and transfer of information.

The circuit traces and the pins of a chip module symbolizes microelectronics.

The exclamation point symbolizes innovative ideas

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Advanced Science and Technology Institute

2002 Annual Report

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MESSAGE

Dr. Estrella F. Alabastro

Secretary, DOST

2002 is a significant juncture for ASTI as an R&D institution under DOST. The year marked a colorful event for ASTI as it celebrated its 15th founding anniversary. Lucky that I became part of that celebration. Much so, the year also posed a critical challenge for ASTI that is how it can evolve towards a more dynamic and prolific organization building on its accomplishments and successes over the years given its limited resources.

In view of this, may I extend my greetings and felicitations to the men and women behind ASTI's success. May your accomplishy Institutements as a team provide you with inspiration to indeed fulfill DOST's dream for ASTI to be the frontline for R&D in ICT and Microelectronics in the Philippines.

It might have been difficult for all of us to fulfill the targets we have set for the year because of continued economic downtrend but we should not lose sight of our vision for it gives us hope and strength to move on. Notwithstanding, ASTI has shown that difficulty can be transformed into opportunities. ASTI's accomplishments for 2002 are considered significant milestones in the promotion of R&D work in the industry.

I hope the same level of energy be maintained by the institution in the coming years. Thank you and congratulations.

DR. ESTRELLA F. ALABASTRO

MESSAGE

Dr. Delfin Jay M. Sabido IX

Director, ASTI

As the years go by, the challenge of being the Director of ASTI is growing. All these years, ASTI strives for the best to be able to fulfill its mandate and most of all face the challenge of being responsive to the needs of its local market. My all-out thanks go to the committed and young fellow ASTI workers for their unflinching effort to contribute in the fulfillment of ASTI's mission and vision.

As we face the coming year, we look forward to a store of exciting and innovative ideas, spurred on by the emphases on ICT in the Medium Term Philippine Development Plan (MTPDP) of the National Economic Development Authority (NEDA). In its policy framework, the MTPDP realizes the need "to disperse ICT capabilities across a broad range of economic activities and income groups and to build on the country's strengths and gain greater momentum in the nation's quest for rapid and sustainable development and growth". Studies undertaken and reported in the MTPDP reveal that the electronics industry is the Philippines' top export earner. This serves to emphasize the contributions of ICT and microelectronics not only to the country's economy and industry, but more importantly, to the everyday lives of the citizenry in a society that is becoming increasingly dependent on technology.

2002 was another challenging year for ASTI. It was joyful to celebrate its 15th founding anniversary. The year provided more inspiration and a certain push for all of us at ASTI as we increase our collaboration with the different sectors of the Filipino society.

Among ASTI's accomplishments for year 2002 include the following: 1) **Creation of the Bayanihan Linux**, an open-source desktop solution developed to provide schools, government institutions and SMEs an alternative to commercially developed software, Bayanihan Linux is something we can proudly showcase as Filipino ingenuity in action; 2) **Philippine Research, Education and Government Information Network (PREGINET)**, a nationwide broadband research and education network that not only interconnects academic, research and government institutions in the Philippines, but provides a vital medium for dissemination of knowledge and information. I am happy to report that by 2003, it will be connected nationwide through the establishment of three exchange points and 17 regional access points; 3) **launching of the Microelectronics Open Lab**; 4) **specific R&D initiatives modeling latest technologies** such as Bluetooth™, 802.11, digital microwave radio, radio frequency, embedded systems and microelectronics; 5) launching of ASTI's official publication, the **Philippine Journal of ICT and Microelectronics (PJICTM)**, which aims to provide an avenue for exchange of new knowledge and efforts in ICT and Microelectronics in the Philippines; 6) **ASTI's new logo**, a symbol of its institutional growth through the years; 7) **formulation of the Strategic Plan for the Philippine Electronics Industry**, in collaboration **with SEIPI, EIAPI, DTI, BOI, CHED, Katipunan Forum, Brain Gain Networks** to make the Philippines a world-class zone of technology innovation through the conduct of trainings, R,D&E services, establishment of a convergence point for technopreneurs, investors, businessmen, and scientists, establishment of an HRD plan, incubation, and updating of the curriculum.

Personally, I was glad that I returned as ASTI's director full-time. The same year also appointed Mr. Denis Villorente as the institute's first Deputy Director. All these significant events of ASTI will serve as a source of our renewed strength and inspiration as we face the challenges ahead of us in this century. ASTI promises to pursue its mandate and continuously contribute to national development. We hope that through our efforts, we will be able to enhance the sector of ICT and Microelectronics and promote knowledge building.

To our partners, to DOST most especially Sec. Estrella F. Alabastro, we thank you for always supporting our efforts.

Dr. Delfin Jay M. Sabido IX

INTRODUCTION

For 16 years, the Advanced Science and Technology Institute has been serving its commitment towards nation building through the conduct of its mandate of doing research and development in the Information and Communication Technologies (ICT) and Microelectronics. By virtue of Executive Order 128, ASTI was established on January 1986 under the Department of Science and Technology (DOST).

Young, dynamic and multitalented staff are the primemovers of the Institute's unrelenting quest for new knowledge and technologies envisioned to earn the Philippines a name in the areas of ICT and Microelectronics. The culture and atmosphere of teamwork, service and commitment being fostered at the Institute has served to empower our workforce and sustain their commitment and dedication to the mission and vision of the Institute.

Responsive technologies - being market-driven and having social consciousness are among the core interest of the Institute's projects, where sustainable R&D in electronics, software and communication systems are carried out to produce excellent products and services for the evolving Filipino society.

The unwavering dedication to the mandate with which the Institute was tasked has driven us to see vital projects to fruition through the years that the Institute has been in existence, establish linkages and networks among industry, the academe and the public and private sectors, and develop technologies in the service of the Filipino. It is this same dedication and commitment that will propel the Institute in the coming years, to be equal to its task of seeking new and advanced technologies that would make the country globally competitive in the fields of ICT and Microelectronics.

Highlights of Accomplishments

Project Accomplishments

Project accomplishments in Information and Communications Technology include:

High Performance Research And Education Network: Philippine Research, Education And Government Information Network (Preginet) Project. The year 2002 witnessed significant developments for PREGINET. Three exchange points, in Quezon City, Cebu City and Cagayan de Oro City, became fully operational in January 2002. As of December 17, 2002 access points were established, interconnecting 54 academic and government institutions. Several network services such as videoconferencing, bio-mirror, webhosting, ftp, and proxy were also made available through PREGINET. The network has been hosting the websites of 22 provinces under the League of Provinces of the Philippines and 5 government agencies. It also provided DNS service to 280 government institutions nationwide. Research and development initiatives on networking technologies were exemplified by the conceptualization of projects in IPv6, network measurements, and multimedia over IP. Technology talks about advanced networking were conducted throughout the year, as well as advocacy and promotion efforts devoted on intensive marketing and project briefing among partners from the academe and industry about PREGINET. Collaborative endeavors were forged through the signing of Memoranda of Agreement with other DOST line agencies and regional offices, the academe and government groups.

Radio Frequency (RF) Microelectronics For Wireless Technologies: Phase 1 Project. The completion of this project implemented 3-tiered research activities – the development of Digital Microwave Radio (DMR), design of Radio Frequency (RF) Integrated Circuits, and development of Bluetooth™ Host-Side Protocol Stack – covering almost all aspects of wireless product development. The outputs of the project not only established the design foundation and knowledge base in wireless technologies but also generated technological outputs with tremendous commercial potential.

Radio Frequency (RF) Microelectronics For Wireless Technologies: Phase 2 Project. The 2nd phase commenced in August 2002 with focus on 1) design and development of a general-

purpose RF transceiver that can suit different applications; 2) design and building of a broadband wireless system prototype that can be used by industry; 3) development of a mechanism to encourage academe's involvement in wireless research; and 4) coming up with good system specifications for optimized performance through simulation and channel modeling. A major project effort was the development of the broadband wireless system prototype, realized through the accomplishment of a paper design of the microwave link and execution of site and path surveys.

Launching of ASTI Open Source Desktop Solution: Bayanihan Linux version I. Aimed at providing universities, SMEs and government institutions a viable alternative to expensive commercial software, ASTI developed the Bayanihan Linux, an open source desktop solution and launched it during the DOST Press Conference at the Richmonde Hotel on June 13, 2002. Free CDs were given to media people. As a strategy of promoting the use of the Bayanihan Linux, ASTI distributed free copies to target beneficiaries and made it fairly available for download to anyone interested.

Bayanihan Linux was also re-launched during the celebration of National Science and Technology Week 2002 Opening Ceremonies on July 14, 2002 at the Phivolcs Auditorium. Among those who were present during the opening ceremonies was Finance Secretary Ruben Camacho.

Linux Terminal Server Project. This is a new project of the Institute, borne out of the need and advantages of server-based computing, the LTSP is an open source solution envisioned to allow its users to run applications from the server, and access the web and email. The LTSP team had already established the LTSP set up with some clients running on Intel 80486 based CPUs.

Project innovations of the Institute for the year are with regards projects on Beowulf Clustering, System Software Development for Wireless Mobile Devices, ASTI Management Information System, and Systems Engineering.

Project accomplishments in Microelectronics include the completion of the **Microelectronics Design for Philippine Electronics Industry (Phase I) – Establishment of Virtual Center for Technology Innovation (VCTI) Microelectronics Design.** The initial phase of project implementation was concluded in July 31, 2002, with major project activities categorized under infrastructure building, research and development, and technology transfer.

Microelectronics Design for Philippine Electronics Industry, Phase 2: Digital, Analog and Mixed Signal Components for Signal Processing and Wireless Applications. The project commenced its second phase last August, with research

efforts directed towards the development of digital, analog and mixed signal components for signal processing and wireless applications. Analog and Mixed-Signal (AMS) Microelectronics is another aspect of the development of system-on-a-chip (SoC). Accomplishments included the study of CMOS data converter architectures, gathering of specifications of data converters, and study of Analog-to-Digital Converter (ADC) design. The Institute was able to contribute to the development of a skilled workforce adept in IC design through this project. The Open Lab or IC design facility has been instrumental in providing opportunities for local engineers to acquire hands-on experience in IC design.

Other projects in microelectronics include Process Development for Multilayer Printed Circuit Board Fabrication, completed in April 2002, the Layout Design Project, and the Embedded Systems Development project.

Celebration of ASTIweek 2002

ASTI week 2002 was a week-long celebration of ASTI's 15th anniversary. The event simply titled ASTI week: ASTI on its 15th Year was held from January 28 to February 1, 2002 at the ASTI Building and was attended by approximately 870 visitors from the industry, government and academe.

Aimed primarily at showcasing the efforts of the Institute in order to introduce and promote its capabilities, ASTI conducted 9 technology talks and 25 exhibits featuring the latest in technology and trends.

It was the first major celebration of ASTI's anniversary and a successful move towards promising ventures in the future.

Receipt of Grant from Ayala Foundation USA

Ayala Foundation USA (AF-USA) was established to serve as a bridge between Filipino communities in the US and in the Philippines by a) providing Filipinos based in the US with an effective mechanism for philanthropic giving to support social development initiatives in the Philippines, and b) providing local nonprofit organizations with access to an alternative and non-traditional source of funds for programs and projects.

For this year, ASTI was awarded a grant in the amount of US$20,000 from the Ayala Foundation USA to fund trainings for staff.

Launching of the Philippine Journal of ICT and Microelectronics (PJICTM)

One of the major highlights of ASTI's 15th anniversary celebration was the launching of its official publication, the Philippine Journal of ICT and Microelectronics (PJICTM). The Journal is aimed at becoming a channel for the exchange of new knowledge and efforts in the areas of ICT and Microelectronics in the country and features technical papers, technical notes and research briefs done by institutions and individuals.

Launching of New Logo

Another highlight of ASTI week is the launching of the Institute's new logo. Last year, a contest was held for a new ASTI logo that can well represent the research focus of the Institute. The winning logo was chosen by DOST Sec. Estrella F. Alabastro.

Mr. Denis Villorente as Deputy Director

The year 2002 was the year when the Institute's first deputy director was appointed in the person of Mr. Denis Villorente, who holds the concurrent post of Officer-in-Charge of the Communications Engineering Division (CED) of the Institute. With the surge in the number of projects and collaborations with both private and public sectors, the Deputy Director of the Institute will be working hand-in-hand with the Director in overseeing the implementation and monitoring of ongoing projects and the expedient management of administrative matters.

Dr. Sabido reinstated as ASTI Director

The projects and innovations initiated in the past years were given a fresh boost with the reinstatement of Dr. Delfin Jay M. Sabido IX as the Institute's Director. Dr. Sabido has been responsible for the mobilization of several significant projects and the forging of vital links with various sectors in pursuit of the ASTI mandate. With Dr. Sabido at the helm, supported by a team of dynamic and competent IT staff, the Institute looks forward to another productive and exciting year.

Challenges and Directions

The institute's activities will continue to focus on the following program thrusts:

- **Information and Communications Technology (ICT) Program**

  ICT Program consists of three components, namely: Advanced Network Research, Wireless Technologies and Network Applications and Software.

  The *Advanced Network Research* component seeks to develop competency in advanced networking technology, services, applications, and architecture; establish a national research and education network; develop, deploy, adapt, and adopt strategic networking technologies, services and applications. This component strengthens the activities of the country in areas such E-commerce, telemedicine and distance education not only through infrastructure development, but also by forging partnerships with research networks outside the Philippines.

  The *Wireless Technologies* component aims to develop capability in fundamental design and implementation of industrial grade modules of wireless communications systems to a skill level that is able to produce world-class innovative wireless technologies. This component involves development of devices, components, transmitter and receiver architectures; formulation of wireless broadband solutions; R&D at millimeter and sub-millimeter frequencies; and development of space-qualified communications systems.

  The *Network Applications and Software* component aims to develop expertise in software development in network applications to be able to produce marketable software and firmware products. This component deals with R&D on network applications such as E-commerce and related technologies; establishment of a testbed for either business-to-consumer or business-to-business commerce and development of E-commerce software and storefronts. Other network applications being looked into include IP telephony, video/image processing, Bluetooth, artificial intelligence, security and authentication, videoconferencing, among others.

• Microelectronics Program

Microelectronics Program intends to set-up a state-of-the-art microelectronics design facility where one can do quality R&D work; cultivate a skilled workforce adept in IC design through training and exposure to actual design work; and develop system-on-a-chip (SOC) capability within three years. Specific activities being undertaken include research on low-power design and MEMS, study options for design flow using freeware, production of ARM chip, among others.

Having envisioned to do projects that "cross divisional boundaries", for 2001-2005, all technical divisions of ASTI will be consolidating their efforts to come up with the country's first system-on-a-chip – an integration of all components of wireless devices- for wireless technologies. This is in response to the predicted surge of demand for wireless devices in 2005.

• Technology Transfer Program

The **Technology Transfer Program** pursues dynamic assimilation of research results by industry, academe, NGO's and government instrumentality. It aims to transfer R&D outputs and advanced/specialized know-how through: (1) Technology diffusion/commercialization; (2) Collaborative R&D; (3) Conduct of training and seminars; and (4) Industry studies.

To carry out the objectives of the Program, the Business Development Unit will focus on commercializing ASTI researches which have market potential, facilitating internal and external dissemination of technologies developed by the institute and helping build infrastructure for technology transfer.

• A GOCC in the future

A challenge that ASTI is currently working is to become a Government Owned and Controlled Corporation (GOCC). This is a result of a study conducted by the Development Academy of the Philippines in August 2000 and a recommendation by the DOST officials and the Technical Working Group for the review of the agency's mandate. It was recommended that ASTI could best serve the country as A GOCC with partial support from the government.

Efforts to realize this significant development into fruition are still ongoing at the Institute; financial feasibility studies and other relevant studies will be conducted in 2003 to fully demonstrate the relevance of becoming a GOCC.

IMPLEMENTATION OF HIGH PRIORITY FLAGSHIP PROGRAMS

R&D Accomplishments: ICT Program

Development of a High Performance Research and Education Nework: Philippine Research, Education and Government Information Network or PREGINET (On-going)

Project Leader: Mr. Denis F. Villorente

Source of Funds: ASTI, DOST-GIA

PREGINET is a nationwide broadband network that interconnects local academic, government and research institutions with other research and education networks worldwide. This network has established its presence in almost all regions of the country.

The PREGINET Network

The three (3) exchange points in Quezon City, Cebu City, and Cagayan de Oro City became fully operational starting January 2002. This was followed by the installation of access points in various regions. As of December 2002, seventeen (17) access points were established. These are located in (1) Mariano Marcos State University in Batac, Ilocos Norte; (2) Don Mariano Marcos Memorial State University in San Fernando, La Union; (3) Philippine Science High School Cagayan Valley Campus in Bayombong, Nueva Vizcaya; (4) Benguet State University in La Trinidad, Benguet; (5) Philippine Rice Research Institute in Muñoz, Nueva Ecija; (6) ASTI in Diliman, Quezon City; (7) Philippine Council for Agriculture, Forestry and Natural Resources Research and Development in Los Baños, Laguna; (8) DOST Regional Office VI/TELOF VI in Iloilo City; (9) DOST Regional Office VII/ TELOF VII in Cebu City; (10) DOST Regional Office VIII/TELOF VIII in Tacloban City; (11) Leyte State University in Baybay, Leyte; (12) Ateneo De Zamboanga University in Zamboanga City; (13) DOST Regional Office X/TELOF X in Cagayan de Oro City (14) Mindanao State University – Iligan Institute of Technology in Iligan City; (15) DOST Regional Office XI/TELOF XI in Davao City; (16) University of Southern Mindanao in Kabacan, North Cotabato; and (17) DOST CARAGA/TELOF CARAGA in Butuan City.

With these access points in place, fifty-four (54) academic and government institutions got connected to PREGINET.

In order to enable PREGINET partners to do their research and have connectivity to research networks in other countries, the project has been maintaining its links via the Asia Pacific Advanced Network (APAN)/Ministry of Agriculture, Forestry and Fisheries Information Network (MAFFIN) and the Asian Internet Interconnection Initiative Project (AI3). Peering and transit of PREGINET was done through APAN and AI3 and through Inter.net, BellTel and PhNet's CORE to maintain its availability. It is also interesting to note that the project was able to implement Unidirectional Link Routing to AI3.

With regard domestic facilities, the project has been using the TELOF and some major Telecommunication Providers' facilities. The 2 MHz of bandwidth from Agila II satellite, which was acquired from PLDT-Mabuhay free for one year will also be used soon. ASTI has also secured approval of frequency license applications from the National Telecommunications Commission on broadband network and satellite transmission.

Network Services

Several network services such as videoconferencing, bio-mirror, webhosting, ftp, and proxy were also made available through PREGINET. The network has webhosting the websites of twenty-two (22) provinces under the League of the Provinces of the Philippines and five (5) government agencies/projects. It also provided DNS service to 280 government institutions nationwide.

To achieve competency in the integration of various network technologies and provision of network services, the following activities were carried out: 1) MPLS Testbed Configuration for Bandwidth Management System; 2) Testing and installation of Web/Proxy High Availability System or HAS for NCC webhosting project; 3) upgrading of PREGINET Network Monitoring System; 4) Installation of Biomirror system; 5) Data Analysis tools and methodology for use in the provision of Quality of Service (QoS) over PREGINET; and 6)Installation and Testing of OpenSource Instant Messaging (IM) System.

R&D on Networking Technologies

IPv6

In terms of developing the next generation network testbed to connect universities and research institutions, the IPv6 Network testbed with connection to the 6BONE via the AI3 network as well as multicast connectivity to the MBONE through the Asia Pacific Advanced Network (APAN) were established.

The IPv6 research proposal submitted to the PAN-ASIA ICT R&D Grants Programme was approved for funding. This will enable ASTI to further strengthen its scientific investigation on IPv6 and carry out a successful IPv6 Deployment in the Philippines. To facilitate advocacy efforts and deployment of IPv6, the pilot sites chosen are UP Diliman, Central Visayas Information Sharing Network (CVISNET) in Cebu City, and Mindanao State University-Iligan Institute of Technology in Iligan City.

Network Measurements

The continuing research activities on advanced networking technologies and services generated the following significant outputs: (1) Network Monitoring System; (2) Monitoring Information Base (MIB) for the Satellite Modem; (3) PREGINET Network Weathermap System which includes AI3 network, DOST-QCNet, and DOST-Bicutan network; (4) Network Time Protocol (NTP) using Global Positioning System; (5) PREGINET Trouble Ticketing System (PTTS) using Open Trouble Request System (OTRS) with SMS/Text Messaging; (6) Looking Glass using PC router; (7) Access Logger v1.0 plus counter of Netmon website; (8) Multi- Router Traffic Grapher (MRTG) Viewer; 9) new PHP enabled Netmon website; 10) Real-Time Network Status Reporting; (11) Netflow Grapher and Database Tool; and (12) PREGINET SMS Monitoring Gateway.

Multimedia over IP

To demonstrate the novel applications of the technologies being studied by the team, twenty-nine (29) videoconferencing events were held. These included the videoconferencing sessions between ASTI-APAN-SingaREN, between PCHRD-Singapore-Cebu-Iloilo during the presentation on Bioinformatics held on the occasion of the 20th Platinum Anniversary celebration of PCHRD, between the Agriculture working group-APAN/MAFFIN, and between ASTI-USA when a masteral student presented his thesis to four members of the panel from the Philippines and one from the Texas Children's Hospital. The team also provided videoconferencing service during the 2002 National Science and Technology Week, Cyber-conference with the Asia Network and Incubation Center (ANIC) of Japan, ConNext event of

the National Computer Center, PREGINET Visayas launching, U.P. Open University Distance Learning, and Educonfab 2002 organized by the Science and Technology Advisory Council-Japan (STAC-J).

Moreover, multipoint conferencing with local PREGINET partners was done using a multipoint control unit. This was specifically demonstrated during the Regional Science and Technology Week celebration of the DOST Visayas cluster, the 55th Anniversary celebration of the DOTC Telecommunications Office, Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development (PCARRD) anniversary, and the Annual Conference of scientists and researchers of the Philippine Rice Research Institute in Munoz, Nueva Ecjia and three universities in the United States namely, Ohio State University, Pennsylvania State University and Virginia Institute of Technology. To further improve the videoconferencing service being offered by PREGINET, more multimedia technologies have been explored. Research activities on Open Source MCU application on Red Hat Linux and OpenH323 proxy were undertaken.

Another multimedia application being explored is on distance learning. The partner institutions such as the Philippine Science High School, University of San Carlos in Cebu, Science Education Institute, Mindanao State University – Iligan Institute of Technology, UP Open University, Don Mariano Marcos Memorial State Univeristy in La Union, and Ateneo Zamboanga University already submitted their proposed research activities over the PREGINET network.

Multicasting is one of the videoconferencing services that can soon be availed through PREGINET. In preparation for this, the research team set up the Multicast enabled testbed network, configured the routers at the regional level, and conducted testing on ASTI's testbed network. Aside from multicasting, live streaming service was also implemented and made available to local partners. Archiving of technical trainings and tutorials as well as webpage development for video-on-demand service is also underway.

Another multimedia application that is being tested over the PREGINET network is Voice over IP (VoIP). VoIP is a term used in IP telephony for a set of facilities managing the delivery of voice in digital form in discrete packets, using the internet facilities.

Talks Conducted/ Papers Submitted/Conferences Attended

Mechanisms by which ASTI research staff can impart the knowledge and expertise gained through the project were adopted. Technology talks entitled "Traffic Engineering Implementation on PREGINET" and "Introduction to Network Security" were conducted and tutorials on "Network Simulation" and "IPv6" were held during the Third National Electronics and Communications Engineering (ECE) Conference last November 27 – 29, 2002 at U.P. Diliman. There were also technical papers accepted, presented and/or published in local and international conferences such as (1) INET 2002 held in June 2002; (2) National Academy of Science and Technology (NAST) last July 2002; (3) APAN 2002 Shanghai Conference held on August 25, 2002; (4) 4th International Forum on Advanced Satellite Communications in the Asia-Pacific Region held in Tokyo, Japan on Nov. 18-19, 2002; (5) Taiwan's TWAREN Initiative held in Taiwan on December 18 to 19, 2002; and (6) SAINT 2003 Conference to be held in Orlando, Florida on January 27, 2003. Other papers were also presented and/or published in the Philippine Journal for ICT and Microelectronics Journal, Internet Workshop of the ISPAN '02, First National Conference on E-Learning, 2002 P-SUCCESS Convention, and of the 28th Asia Info-communications Council Conference in Manila.

Advocacy and Promotion

Considering that the operation and sustainability of PREGINET will depend largely on its partners, a significant percentage of the team's efforts were devoted on intensive marketing and project briefing. Project presentation meetings and site visits were conducted in nearly all regions. Among these meetings were with the IT Core Group of Benguet State University, Region I Regional Development Council, Local Government Units of Benguet, Bureau of Agricultural Research, House of Representatives, Bureau of Internal Revenue, National Telecommunications Commission, Department of Transportation and Communication –Telecommunications Office, National Telehealth Center of U.P. Manila, BITSTOP Inc. of Dagupan City, DIGITEL, AZCom, among others. A presentation for Japan's Ministry of Agriculture, Forestry and Fisheries Information Network (MAFFIN) was also done.

Signing of Memorandum of Agreement (MOA) with partners, which signal the start of collaborative endeavors over PREGINET were also accomplished. Those agencies with signed MOU include DOTC-TELOF, DOST VI, DOST VII, DOST VIII, DOST X, DOST XI,

DOST CARAGA, U.P. System, U.P. Open University, League of Provinces in the Philippines (LPP), Bureau of Agricultural Research, Benguet State University, Mariano Marcos State University, Philippine Science High School-Cagayan Valley Campus, Philippine Rice Research Institute, CVISNET, Leyte State University, Leyte Institute of Technology, Philippine Science High School-Eastern Visayas Campus, Mindanao State Polytechnic College, Mindanao State University – Iligan Institute of Technology, and University of Southern Mindanao.

As PREGINET continues its efforts of expanding its network, it also strengthens its endeavor to encourage partner institutions to share more content and provide more applications over the network. The thrust is to expand the network and at the same time have more content available to the partner institutions for the sustainability of the network and foster collaboration and partnership.

Bayanihan Linux: An Open Source System for Workstations and Servers (On-going)

Project Leader: Mr. Peter Antonio B. Banzon

Source of Funds: ASTI

This project aims to integrate a free open-source operating system and free applications to eventually come up with a complete system that can work on a desktop. It also hopes to provide the country with an alternative solution to address software piracy, to enhance software development skills of the Filipinos, and to develop more affordable computer systems.

In pursuit of this goal, the team developed an ASTI Open Source CD called Bayanihan Linux version 1.0 which has generated a lot of interest from the government, industry, academe, and media after its successful launching in May 2002. This is non-proprietary software that costs much less or none at all compared to its commercial counterpart. The use of open source software is advantageous as it runs on lower-end computers. It is generally compatible with proprietary software. Moreover, it has a large community of developers and supporters worldwide.

The CD was customized and bundled with Red Hat 7.2, with innovative and widely used applications. The Installation Manual Procedure, Getting Started Manual, and Linux Directory Structure Manual were also incorporated in the CD. About 500 CD copies were distributed to various institutions. Continuous efforts have been done to improve this CD and to ultimately produce Bayanihan Linux version 2.0 which will be released in January 2003.

To promote and introduce Open Source Technology and its benefits to both public and private organizations, several trainings, presentations, and demonstrations were conducted on different Open Source tools and applications. Two technical presentations entitled "Open Source: Here, Now, and Forever" and "Linux as a Workstation and Server" were two of the well attended sessions during the ASTIweek. Open Source Roadshows were likewise held in Region IV - Lucena City (May 23-24, 2002), Region XIII - Butuan City May 27-28, 2002), and Region I - San Fernando, La Union (May 30-31, 2002), in collaboration with PREGINET project. All in all 304 representatives from academe, government, and private sector benefited from these seminars and technical talks.

Other significant project undertakings were: 1) uploading of Bayanihan website; 2) publishing technical paper entitled "Comparative Study on Free Operating Systems"; and 3) participation in various exhibits.

Linux Terminal Server Project (New)

Project Leader: Mr. Peter Antonio B. Banzon

Source of Funds: ASTI

LTSP is an open source solution born out of the need for a terminal that can communicate with a Unix application server. It is envisioned that the graphics terminal will run Transmission Control Protocol/Internet Protocol (TCP/IP) and allow its users to run applications from the server, and access the web and email. It is also inexpensive and easy to maintain. The solution is a diskless workstation, a computer that doesn't need a hard disk, floppy or CD-ROM to boot from. LSTP connects to a server to get its IP address, downloads the operating system, and mounts its own root filesystem. Thereafter, it loads the X-Server software (a process which controls a bitmap display device in an X-Window System - a specification for device-independent windowing operations on bitmap display devices) into memory and executes it. Eventually, a user will be allowed to log in and executes applications from the server. Because the workstation is only running few programs, any inexpensive and low-end computer can be used in this setup. So far, the team had already established the LTSP set up with some clients running on Intel 80486 based CPUs.

Beowulf Clustering (New)

Project Leader: Mr. Peter Antonio B. Banzon

Source of Funds: ASTI

Beowulf Cluster is a set of computers that operates through parallel processing. It is a cheaper alternative to a super computer. Many complex applications can be made to run on a Beowulf cluster. It could be a comput-

ing intensive application like image processing, graphics simulation, design simulation, signal processing or pattern recognition. A Beowulf cluster set up can also be the jump-off point for initiating research ideas in parallel computing and programming.

System Software Development for Wireless Mobile Devices (New)

Project Leader: Mr. Bienvenido H. Galang, Jr.

Source of Funds: ASTI, PCASTRD-GIA

This project is an offshoot of the previous R&D efforts on BluetoothTM protocol stack. Specifically, the activities are now geared towards the development of an Open Source Bluetooth Integrated Solution that empowers local application software developers. The objective of the project is to improve the state of the Philippine software industry by providing tools, services, and solutions that enable development of original, innovative, and world-class software.

The project started in November 2002. Some of the accomplishments after two months of implementation are the following: 1) evaluation of OpenBT protocol stack and the BlueZ protocol stack; 2) evaluation of Ericsson ROK 101 007, ROK 101 008, ROK 104 001 Bluetooth chipsets, and the CSR Bluecore2 chipsets; 3) configuration and customization of BlueZ; 4) development of sample applications (ASTI BT Kit checker and ASTI Bluehood); 5) incorporation of BlueZ and the sample applications with the release of Bayanihan Linux version 2.0 which is scheduled in January 2003; and 6) conduct of initial discussions with potential partners such as U.P. Philippine General Hospital and Eazix Inc.

ASTI Management Information System (On-going)

Project Leader: Mr. Peter Antonio B. Banzon

Source of Funds: ASTI

With the end goal of automating some of the administrative tasks at the institute, the project team continued its efforts in developing new information systems. These Information Systems include: 1) ASTI Reservation System, 2) Technology Intelligence System, 3) Request for Repair System, 4) E-mail System, 5) Pass Slip System, and 6) Personnel Feedback Form. Almost all of these systems have already been rolled out and are now being used in the day-to-day administrative operations of the institute.

Other systems that were previously developed by the team and which were deployed to the different agencies of DOST were the Document Tracking Information System (DTIS) and Personnel Management Information System (PMIS). Using the feedbacks and suggestions made by those who were using these systems, the team did some enhancements which include among others the integration of multiple user capability as well as incorporation of automated back-up script for PMIS.

Web development is another initiative of the project. The team is in-charge of the regular updating of the ASTI website and uploading of the project websites.

In cooperation with PREGINET, provision of the .gov.ph Domain Naming System (DNS) service was also undertaken. Applications of all government institutions for domain name were being reviewed by an MIS staff.

Other achievement of the project were the setting up of library browsing station, setting up of scanning and burning stations, uploading of APEC CD database, drafting of asset management allocation policies, and conduct of PC audit.

To transfer the knowledge acquired, the project team conducted trainings not only for ASTI staff but also for the academe and other government agencies. Trainings on the Daily Time Record system, Star Impress, Network Fax, Information Systems, Hypertext Pre-Processor (PHP), Hypertext Mark-up Language (HTML), and Postgre Standard Query Language (PostgreSQL) were held. In the same manner, the project outputs highlighted in various exhibits and technology forums such as E-Services, ASTIweek, E-Gobyerno, Independence Day and National Science and Technology Week.

Systems Engineering (On-going)

Project Leader: Ms. Marga Michelle C. Tabangcura

Source of Funds: ASTI

ASTI's Systems Engineering Group is another research team performing a critical role as far as product development is concerned. The team is responsible for system-level design of embedded and communications systems. In pursuit of its role, the group obtains user requirements and translates them into technical system specifications.

So far, the team has accomplished the following: 1) Design and development of a stand-alone mobile device; 2) Conduct of market study for a stand-alone mobile device; 3) Development of Stage Gate plan for ASTI; 3) Conduct of initial technical and market assessment of Thin Client; 4) Development of process improvement roadmap; 5) Conduct technology intelligence on different embedded and communications systems; and 6) Conduct of site visits to some manufacturing sites, among others.

For the next five years the activities of the team will be focused on Education and Research for SE-CMMi application and optimization for certification; Modeling & Tools for Model-driven system design; and Applications for embedded and communications systems.

R&D Accomplishments: Microelectronics Program

Radio Frequency (RF) Microelectronics for Wireless Technologies: Phase I (Completed)

Project Leader: Dr. Delfin Jay M. Sabido IX

Source of Funds: ASTI, DOST-GIA

This project has implemented three-tiered research activities namely, development of Digital Microwave Radio (DMR), design of Radio Frequency (RF) Integrated Circuits, and development of BluetoothTM Host-Side Protocol Stack. All these research efforts were considered strategic in the sense that these covered almost all aspects of wireless product development from the system level to the device level then to the application development. The project was not only successful in establishing the design foundation and knowledge base in wireless technologies but also in coming up with technological outputs having tremendous commercial potential.

As the first phase of project implementation came to an end, the following milestones became apparent:

Digital Microwave Radio (DMR)

Among the major accomplishments as far as the broadband system design is concern are the following: 1) 4-channel subcarrier multiplexed system; 2) wireless video testing; 3) design of 5.7 GHz RF modules; and 4) research on Orthogonal Frequency Division Multiplexing (OFDM). To be able to develop a 4-channel subcarrier multiplexed system, the project team went through a number of experiments on the packaging of the RF modules, testing of the 2.048 Mbps modem, and synthesis of the Reed-Solomon Error Correction Codec. The wireless video testing between the building of ASTI and that of the UP Department of Electrical and Electronics Engineering (UPEEE) obtained positive outcome. Test results showed that the wireless link between the two buildings was indeed established and the video transmission was successfully done. With regard to the design of 5.7 GHz RF modules, the designs of hairpin filters, mixers and amplifiers using Duroid as a substrate were accomplished. The team also studied the fundamentals and theoretical background of OFDM as well as the basic building blocks of an OFDM system.

Radio Frequency Integrated Circuit (RFIC)

To gain proficiency in using industry-standard RFIC design tools, the researchers had gone through the different stages of RFIC design flow including schematic entry, simulation, layout, and verification.

The team also proceeded with the design of transceiver building blocks that are essentially found in wireless subsystems. More complex transceiver modules such as voltage-controlled oscillator, variable gain amplifier, and basic modulator/demodulator were designed. Finally, enhancements of the modules from the first fabrication run were made.

BluetoothTM Host-Side Protocol Stack

The Host-Side of the BluetoothTM protocol was developed using Object Oriented Real-Time Techniques (OORT). OORT combines the strengths and benefits of Object-Oriented (OO) Technology and Formal Methods. This approach in Real-time Systems development, such as Bluetooth, supports rapid prototyping cutting the development time in half. The project was completed in about a year's time with between 4-8 software developers.

The Host-Side Protocol Stack was modeled using the Specification and Description Language (SDL), Message Sequence Charts (MSC), and Abstract Syntax Notation One (ASN.1). Formal description techniques (FDTs) such as SDL, MSC, and ASN.1 are used to model the complex protocol, remove ambiguities, and provide early detection of errors.

ASTI Engineer Anne Margrette Caccam working with Bluetooth technology

Simulation of the model yielded promising results. The simulation verifies that the model conforms to the Bluetooth Specification version 1.1. Validation of the system was performed by porting the ASTI Bluetooth Host-Side Protocol Stack to Windows 2000. Porting the stack involved code generation from the SDL model, development of device drivers, and application development. An application, the ASTI Bluetooth Kit Identity Checker, is used to verify the correct installation of the stack. It is similar to Ericsson's software utility program that comes with its Bluetooth Application Toolkit. The Bluetooth Prequalification Software (PreQual) was also used to further certify the quality of the stack.

This project was a first and crucial step for ASTI in developing advanced software and it proves that the Filipino is indeed capable of conducting advanced systems development.

Radio Frequency (RF) Microelectronics for Wireless Technologies: Phase II – Development of Advanced Broadband Wireless System (On-going)

Project Leader: Dr. Delfin Jay M. Sabido IX

Source of Funds: ASTI, DOST-GIA

Having commenced the 2nd phase of project implementation on August 1, 2002, the team's efforts are now focused on the: (1) design and development of a general-purpose RF transceiver that can suit different applications; (2) design and building of a broadband wireless system prototype that can be used by the local industry; (3) development of a mechanism to encourage academe's involvement in wireless research; and (4) coming up with good system specifications for optimized performance through simulation and channel modeling. Initially, the team consulted a local company to validate the usefulness of a general-purpose RF transceiver to the Small and Medium Enterprises (SMEs). Assessment of technology forecast on wireless technologies was also done in parallel. To begin with the development works on the transceiver, porting of the device driver for the PC based 802.11b access point has been undertaken.

Another major effort of the project was the development of the broadband wireless system prototype. In pursuit of this milestone, the paper design of the microwave link was accomplished. Site and path surveys were also done. To encourage the academe's involvement in wireless research, the team plans to hold a forum that will be participated in by some representatives from academe and industry. They have already started the preparations for the Open Forum on Wireless Research in the Philippines, which is scheduled on April 23, 2003. Other on-going activities include gathering of ECE curriculum and subject syllabus, preparation of RF Circuit Design course outline, and development training module.

Finally, review of literature and architecture scan of telecommunication infrastructures for the rural areas were undertaken. The project team was even consulted by the Department of Transportation and Communication on the possible architecture that could be implemented for the rural areas in the Philippines. Coordination with private telecommunication companies was also pursued. The results of these activities are vital inputs in coming up with good specifications for optimized performance of the broadband wireless system.

Microelectronics Design for Philippine Electronics Industry, An Essential Component for Global Competitiveness: Phase I - Establishment of Virtual Center for Technology Innovation (VCTI) Microelectronics Design (Completed)

Project Leader: Dr. Delfin Jay M. Sabido IX

Source of Funds: ASTI, DOST-GIA

The initial phase of project implementation concluded in July 31, 2002. Major project activities categorized under infrastructure building, research and development, and technology transfer were accomplished. Through the Integrated Circuit (IC) Design Laboratory, a research infrastructure established in 2000, ASTI was able to pursue its efforts in developing a 32-bit, five-staged pipeline Reduced Instruction Set Computing (RISC) microprocessor core. This microprocessor was patterned after the architecture and instruction format of the ARM or Advanced RISC Microprocessor. It was modeled in VHDL and was implemented in Field Programmable Gate Arrays (FPGAs).

Experimental results showed that the individual modules comprising the microprocessor met the specifications in the post synthesis simulation. These indicated that the modules developed by the team are indeed functional. The training obtained by the project staff from Bitmapper Integration Technologies enabled them to identify possible sources of errors and helped them expedite the debugging process.

Another significant output of the team was the design and ASIC implementation of an 8-bit Arithmetic Logic Unit (ALU) using 0.25 micron process. The ALU design that was used in the development of the RISC microprocessor was sent to Taiwan for fabrication in March 2002. The fabricated chip was tested and the functional testing and verification obtained the desired results.

During the first semester of 2002, three (3) trainings and technical talks were conducted benefiting almost 100 participants from industry, academe, and government institutions. Among those schools and universities present were University of Sto. Tomas, University of the East, Don Bosco Technical College, Pamantasan ng Lungsod ng Maynila, Polytechnic University of the Philippines, Mapua Institute of Technology, De La Salle University, New Era University, Divine Word College, Mindanao, Mindanao State University-

Iligan Institute of Technology, University of the Southeast Philippines, Mindanao Polytechnic State College, University of San Carlos, University of San Jose-Recoletos, University of Cebu, College of Technological Services-Cebu, La Consolacion-Cebu, Cebu Institute of Technology, University of the Philippines Diliman, University of the Philippines Los Baños. The private companies included Automated Tech., Perkinelmer, Eazix Inc., Ci-tech, Pycontech (PTPI), Maxon, Sharp Phils., PSI Technologies, ASTEC Semiconductor, Remec Manufacturing Phils., and EM2PI.

Alliance and Electric VLSI Design System CDs were also distributed to the faculty members of different universities for evaluation. The distribution package contains Alliance and Electric VLSI Design System freeware with installation instructions and a user's manual. The manual for Alliance includes a review of the VHDL subset used in Alliance and an example of how to implement a circuit using Alliance. For the Electric VLSI Design System, the manual includes how to make schematic and layout designs using the said CAD tool.

Microelectronics Design for Philippine Electronics Industry, An Essential Component for Global Competitiveness: Phase II - Digital, Analog & Mixed Signal Components for Signal Processing and Wireless Applications (On-going)

Project Leader: Ms. Aileen Joy A. Deoma

Source of Funds: ASTI, DOST-GIA

On August 1, 2002, the project entered into its second phase of implementation. This time, the research efforts are directed towards the development of digital, analog & mixed signal components for signal processing and wireless applications. Analog and Mixed-Signal (AMS) Microelectronics is another aspect of the development of system-on-a-chip (SoC) that is being addressed by the project. AMS is deemed vital in designing an SoC as it will bridge the technological gap between the digital and analog parts of the system. The accomplishments thus far, included the study of CMOS data converter architectures, gathering of specifications of data converters, and study of Analog-to-Digital Converter (ADC) design. To better equip the project staff with sufficient know-how on the latest technologies in AMS design, they attended the Microprocessor Laboratory Asian Course on Advanced VLSI Design Techniques using a Hardware Description Language sponsored by the International Centre for Theoretical Physics (Italy), which was held at the Ateneo de Manila University last November 25 to December 13, 2002.

With regard to the Digital Microelectronics side of the project, significant activities were carried out in relation to the development of the baseband controller. These included the study of Bluetooth technology and initial investigation of the baseband and link controller architectures. VHDL coding of individual blocks was already initiated.

The behavioral coding of the other blocks of the RISC processing core was completed. This includes the data/read cache, read/write buffer, memory management unit and co-processor. The multiply instruction was successfully included in the instruction set of the RISC core. The multiply block was integrated in the existing RISC core and was verified to be working at the behavioral level. The team applied the Reuse methodology in the RISC core, rendering the VHDL code of the RISC code more readable and portable. Additional benefits include faster turnover of code from old design staff to new design staff and general code understandability. These improvements can even be beneficial to licensees in the case of a licensed IP.

The outcomes of the abovementioned research activities were thoroughly discussed and presented in four technical papers. These papers were accepted and presented during the 3rd National Electrical and Communications Engineering Conference held in November 2002.

In pursuit of the objective of developing products with a local partner, ASTI entered into an agreement with Soniford Maeller Corp. as regards the development of a microcontroller-based position controller. The team proceeded with the study of software and firmware design. They were also able to finalize the diagram for the board prototype.

An equally important project milestone was the establishment of linkages with the private sector, particularly the Semiconductor and Electronics Industries in the Philippines, Inc. (SEIPI) and Electronics Industries Association of the Philippines (EIAPI). The institute became a member of these two industry organizations in 2002. The project team has been collaborating closely with SEIPI and EIAPI to be able to identify and address the needs of the Electronics industry. It is also interesting to note that ASTI has been actively involved in drafting the proposal on the establishment of the Center of Excellence for the Semiconductor and Electronics Industry. A network of engineers, scientists and technopreneurs from the academe, industry, and government has been spearheading the creation of the said center. This network is envisioned to be the catalyst of a world-class culture of technology innovation in the Philippines.

ASTI, through this project, was also able to contribute in the development of a skilled workforce adept in IC design. With the end goal of transferring the knowledge gained from the research endeavors, several trainings and technology talks were conducted. The Openlab Group conducted Openlab Training Series II last October 21 to 25, 2002. It had two components: the digital and the analog. The digital part consisted of the FPGA design flow (VHDL as the design entry, synthesis, place and route, actual implementation in FPGA) and the FPGA implementation of the AM2901. The ISE Foundation Series and ModelSim were the software used. The analog part was an overview of analog integrated circuit design which included introduction to analog design, discussion of MOSFET characteristics and models and analog layout techniques. The group successfully trained eleven participants in Openlab II. Three came from the academic sector while eight

came from the industrial sector. The Open Lab or IC design facility has been instrumental in providing opportunities for local engineers to acquire hands-on experience in IC design, which enabled them to fully understand the theoretical aspects of Microelectronics.

The project will continue to strive towards the attainment of its mission of catalyzing advancements in microelectronics research by developing world-class design capabilities, promoting a culture of technology awareness, and encouraging active involvement from the academe, industry, and government.

Process Development for Multilayer Printed Circuit Board Fabrication (Completed)

Project Leader: Mr. Alvin E. Retamar

Source of Funds: ASTI

In today's competitive world were windows of opportunities come and go in a flash, the need for rapid prototyping has become a necessity. However, speed does'nt have to come with a hefty price nor does it have to be equated with poor performance. To address the issue of speed, cost and performance , ASTI has ventured into setting up its own Printed Circuit Board facility that provides quick-turn and reasonably priced PCB prototypes. Current capability covers single, double and 4-layer fabrication.

The institute, with its vision of uplifting the lives of Filipinos, has also opened this service to academe and the local electronics industry. ASTI believes that a healthy electronics industry has to be supported well for it to grow. While there are numerous PCB houses located in the Philippines, most of them cater to production quantities which will only be significant upon completion of the prototyping stage. Unfortunately, the prototyping houses are located off-shore, leaving the industry and academe with very little support during development and experimentation. With the availability

of this service, industry and academe now has a prototyping facility within reach minus the hassles associated with imported customized boards such as additional import costs, communication and coordination problems.

This project was completed in April 2002. The 4-layer PCB set-up was already established in ASTI. Once practical experience is gained, this service will be offered to electronics companies and academic institutions.

Dry Film Technology has been adopted for PCB fabrication due to its wider latitude or ability to define fine traces and spaces in a PCB. This in-house technology is envisioned to provide clients with affordable, quick turnaround PCBs for their prototyping needs.

Layout Design Project (On-going)

Project Leader: Mr. Michael Gerard M. Operaña

Source of Funds: ASTI

The Special Projects Division has a Circuit Layout Design team which addresses the first stage of prototype fabrication. Using industry proven software, schematic entries are transformed to manufacturable circuit designs as guided by conventional knowledge and internationally accepted standards for layout. With the group's effort, ASTI has become a member of the IPC, an international organization of circuit designers, manufacturers and suppliers for the electronics industry. ASTI now has access to IPC standards that the staff used to improve and refine its layouting capability. It is the team's immediate goal to learn Design for Manufacturability (DFM) as this is an important component of Product Development.

To put the theory into practice, the team has been engaged in several layout works for a variety of ASTI projects. Once the team has acquired confidence and mastery, the team plans to provide layout design service to the local industry and play an important role in the development of local layouting skills through trainings and seminars.

The Circuit Layout project aims to provide ASTI with layout design capability with emphasis on manufacturability, functionality and reliability. Veering away from the simplistic connect the dots approach without proper regard to important considerations, ASTI's circuit layout team has been assimilating layout science to improve their capability in every aspect. It has evolved into a centralized, quick-acting team that readily maintains schematics, files, parts and libraries. The team also off-loads ASTI's pool of engineers with the burden of layouting so that they can concentrate on other value adding activities or projects. This service is also open to external

entities who do not own licensed software that cost millions of pesos nor the capability to perform the layout task. Indeed, this service will play a vital role in helping schools, SME's and other entities in their design endeavors.

In 2002, the project accomplished the following: 1) conduct of technical talk during the ASTIweek 2002 celebration; 2) fabrication of a new scaled-down EMU board using 6-mil traces and spaces; and 3) completion of the design for manufacturability study.

Embedded Systems Development (On-going)

Project Leader: Mr. Jesus C. Manio

Source of Funds: ASTI

The Embedded Systems Group is the research team of ASTI focused on embedded systems design with the end goal of pursuing short-term product development and engineering for sustainable R&D. The group is divided into two, the product development team and the multimedia team. The product development team is responsible for contract research and rapid prototyping designs while the multimedia team is in charge of implementing the five-year (2001-2005) roadmap.

Through the team's involvement in different R&D projects of the institute and exposure to different technologies, they were able to acquire capabilities on: 1) Control applications/automation; 2) CGI programming/HTML; 3) Device driver development; 4) Microprocessor/microcontroller based designs; 5) Operating System concepts; and 6) Networking application concepts.

These technical skills were applied in some R&D efforts of ASTI such as the development of Network Operation Center (NOC) Rabbit based – webserver as well as the Thin Client. Another application of the microprocessor-based design is the E1 transceiver. This was developed using the HC16 development kit. Other accomplishments of the group were the design of embedded operating systems such as ARM-Linux and eCos, development of embedded applications for ViewML, and initial research on MPEG4 server (a home multimedia device). Research activities were also undertaken in the fields of Embedded Linux, Open h.323, RTP & RTSP networking protocols, etc.

Improvement of S&T Governance, Management and Linkages

AI3 Spring Meeting, April 17-19, 2002, Temasek Polytechnic, Singapore

ASTI Deputy Director Denis F. Villorente participated in the AI3 Spring Meeting and reported developments of the PREGINET, and the country's efforts at utilizing the high speed satellite based network, established contacts with experts in the field of networking, and promoted the ASTI PREGINET project and sought possible collaborations from other countries.

E-Commerce Roundtable Conference, sponsored by the Japan External Trade Organization (JETRO), Kuala Lumpur, Malaysia, 21-23 January

ASTI Director Delfin Jay M. Sabido IX represented the country in this event and discussed the current status and developments of e-commerce in the Philippines. This was also an opportunity to gain insights on technology management and utilization from the other participating countries and their applications vis-à-vis the Philippine setting.

43rd Meeting of the ASEAN Committee on Science and Technology, Indonesia May 13-14

ASTI Director Delfin Jay M. Sabido represented the country as National Focal Person for the Sub-Committee on Microelectronics and Information Technology (SCMIT).

APAN Meeting, 26-28 August, Shanghai, China

ASTI Deputy Director Denis F. Villorente participated in the APAN meeting and presented a paper entitled A Proposal Precision Network Measurements Architecture for the Philippine Research, Education and Government Information Network (PREGINET), established contacts with experts in the field of networking and promoted the ASTI PREGINET project and explored possible collaborations from other countries.

Strengthening and Sharpening Focus of Continuing Programs

Technology Transfer Accomplishments

Technical Services

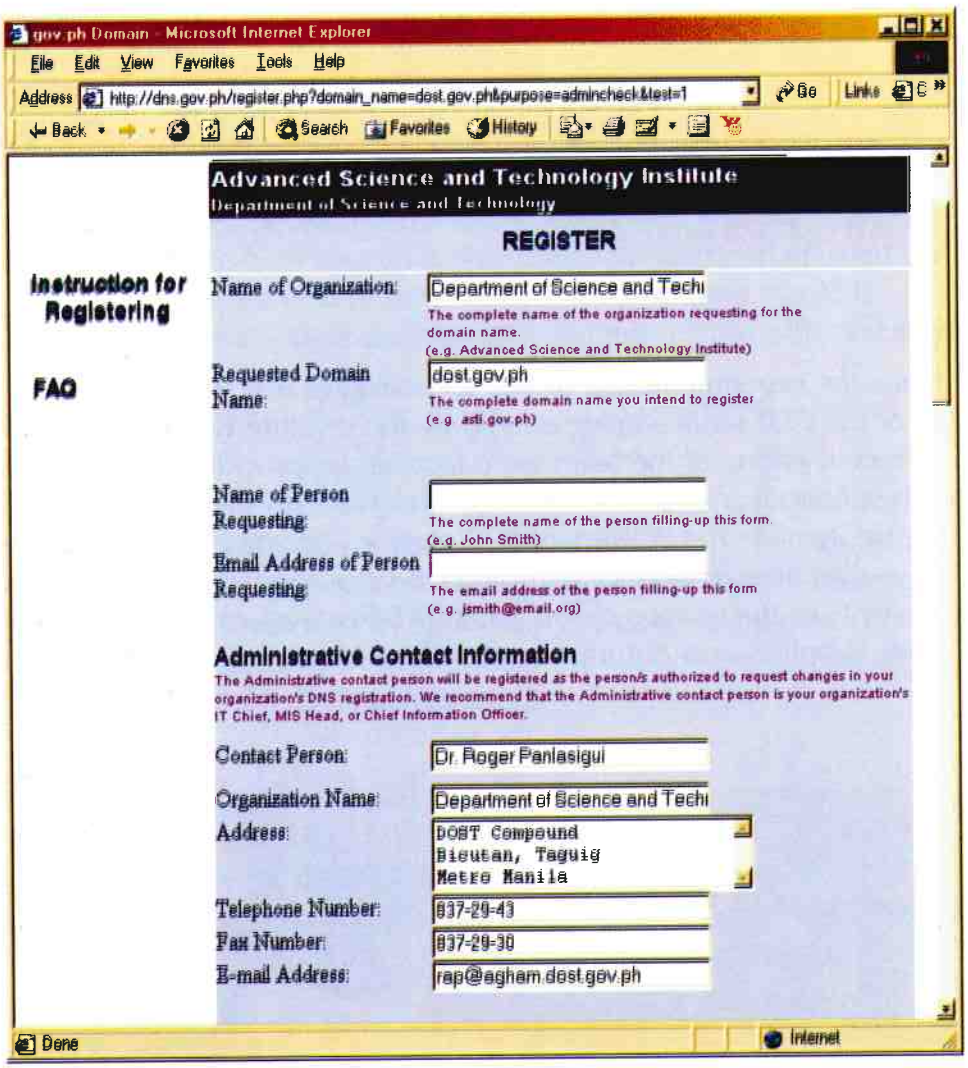
Printed Circuit Board (PCB) Service

Since the experimentation on the technologies that would enhance the quality of the PCB service being offered by the institute were already completed, recent efforts of the team were focused on providing the service and doing the financial analysis. The pricing rates were reviewed to ensure that all expense items in the delivery of PCB service were properly costed. The team was also busy in attending to the PCB fabrication and lay-out design requirements of the various clients such as E-Test System Laboratory, Corp.; Covenant Graphics and Automation; Soniford Maeller Corp.; Automated

An ASTI Engineer working with PCB Fabrication Services

Technology Philippines, Inc.; Fit-in; Amkor-Anam; Eazix, Inc.; Nextest; Best Electronics and Components; ATEC; Test Design Systems; Lexmark; U.P. Electrical and Electronics Engineering; and others.

gov.ph Domain Registry



ASTI has been hosting the online registration for the .gov.ph domain. This service is currently free of charge and is only applicable for government organizations, agencies, and institutes. In 2002, a total of 280 government institutions, including local government units (LGUs) were assisted by ASTI in registering their domain names. These domain names are important to establish the presence of Philippine government agencies on the Internet, thus bringing government closer to the online Filipino.

Upon receiving their online application at http://dns.gov.ph/, a Philippine government organization will be assigned a domain with the suffix ".gov.ph" assuming that they comply with all the requirements. Computers of government organizations with direct access to the Internet (such as their

website and email servers) need to be assigned an Internet Protocol (IP) address that is numeric and unique and hard for people to remember (like a phone number). With the Domain Name System (DNS), the IP numerical addresses are translated into names such as (www.dost.gov.ph), which are easy for people to read and remember.

Videoconferencing Service

The provision of this service was made possible through the PREGINET project. Twenty-nine (29) events organized by government, academic institutions, non-government organizations benefited from the videoconferencing service offered by ASTI. Among those local agencies that availed of this service were Central Visayas Information Sharing Network (CVISNET), Philippine Science High School (PSHS), National Computer Center (NCC), Philippine Council for Health Research and Development (PCHRD), University of San Carlos (USC), University of the Philippines Open University (UPOU), Mindanao State University – Iligan Institute of Technology (MSU-IIT), Don Mariano Marcos Memorial State University, (DMMMSU), Benguet State University (BSU), Leyte State University (LSU), Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), University of Southern Mindanao (USM) and many others.

Webhosting Service

Another service offered by PREGINET was the webhosting for the League of the Provinces of the Philippines (LPP). The websites of LPP and twenty-two (22) of its member-provinces have been housed and maintained by ASTI through PREGINET. These provinces include Abra, Agusan Del Sur, Albay, Antique, Apayao, Aurora, Basilan, Batanes, Benguet, Bohol, Bukidnon, Camiguin, Cavite, Davao Del Norte, Davao Del Norte, Davao Del Sur, Misamis Occidental, Northern Samar, Nueva Vizcaya, Pangasinan, Sorsogon, Sultan Kudarat, Surigao Del Norte, Tarlac, Zambales, Zamboanga Del Norte, and Zamboanga Del Sur. Other agencies such as Virtual Center for Technology Innovation in Information Technology (VCTI-IT), Philippine Science High School, Philippine Council for Aquatic and Marine Research and Development, PHILREEFS, and AQUALINE have also benefited from PREGINET's webhosting service.

Trainings and Seminars

In terms of percent accomplishment, ASTI was able to accomplish 256% of its targets. A total of forty-one technical trainings and seminars were conducted in 2002. Majority of the trainings and seminars were offered during the 15th Anniversary Celebration of ASTI. Among the areas tackled were:

- VHDL and Programmable Logic Devices
- ObjectGeode Software for Network Communications
- Basic Networking
- Network Simulator 2
- Unidirectional Link Routing and Internet Security
- Bayanihan Linux
- ASTI Information Systems
- Digital Design Theory
- Red Hat Linux
- High Speed PCB Design
- Surface Mount Technology
- Videoconferencing

DATE	TITLE OF TRAINING/WORKSHOP/DEMO	PARTICIPANTS
Feb 6, 13, 20, 27	PHP Training	
Feb 27 – Mar 1	Digital Design and Implementation Using VHDL & Programmable Logic Services	
March 7	Technology Innovations Management Seminar	New Era College: 3 STI: 2 ASTI: 10 UP Dililman: 1
March 8	Object Geode	New Era College: 1 UP Diliman: 1 STI: 2 ASTI : 8
April 10	Star Impress TrainingOpen Source CD Installer	
April 12	Internet Protocol: Next Generation Technology	
April	Technology Talk on Netflow	
April	Technology Talk on Traffic Engineering	
April	Basic Networking Training	35 participants from DOST Regional Offices
May 20-25	OpenLab Training Series I	
May 22 to 31	Open Source Roadshow Training in DOST Regions I, IV, and DOST-Caraga	
July 24	Open Source Talk at S&T Week of Region III	
July 26	Introduction to Network Simulator 2	Academe: 62 Government: 19 Private: 1
August 6	Unidirectional Link Routing and Introduction to Internet Security	Government: 18 Private: 1
August 6	HTML Lecture	
August 12-13	Train the Trainers Workshop	
September 24	Wireless System Design	
Nov 25	Bluetooth technology	

Xilinx Training entitled "Digital Design and Implementation Using VHDL and Programmable Logic Device" with lecturers from AST and Xilinx

Xilinx Training

The Virtual Center for Technology Innovation in Microelectronics and the Advanced Science and Technology Institute in partnership with Insight held the Xilinx Training entitled "Digital Design and Implementation Using VHDL and Programmable Logic Device" on February 27 to March 1, 2002 at the ASTI Training Room. Lecturers were from ASTI and Xilinx. The goal of the said training is for participants to understand the essentials of VHDL, write VHDL for effective synthesis and implement designs in hardware using programmable devices. Participants were faculty members from University of Sto. Tomas, Mapua Institute of Technology, University of San Carlos Cebu, Divine Word College Calapan, De La Salle University and New Era University and engineers from Tsukiden, Automated Technology, Perkinelmer, Eazix, Ci-tech, Pycontech, NCO, Maxon and ASTI.

The PCB Team with Mr. Kin Lam, Technical Marketing Executive of Zuken Redac, during the Basic High Speed Design Seminar

The organizers and some of the participants during The Basic SMD Soldering Training/Seminar held last Nov. 28-29, 2002

Consultancy Service

ASTI together with the Semiconductor Industries of the Philippines, Inc. (SEIPI), Department of Trade and Industry – Board of Investment (DTI-BOI), Philippine Economic Zone Administration (PEZA), and Katipunan Forum/ Brain Gain Network (BGN) spearheaded the drafting of the proposal for the Center of Excellence (COE) for the Philippine Semiconductor and Electronics Industry. It is envisioned that the proposed COE will be the country's center for conducting research, development and engineering (RD&E), product development and technology training in key focus areas such as test development, integrated circuit design, wireless communications, and optical electronics.

Informal type of consultancy was also provided to various schools and universities, government offices, and private companies. The topics focused on networking, videoconferencing, .gov.ph, Bluetooth™, open source, PCB, PREGINET, radiosonde system for PAGASA's weather stations, Hypertext Mark-up Language (HTML), information system, wireless network, Linux, Bayanihan Linux, multilayer PCB set-up, etc. The consultancy services rendered totaled to ninety-seven (97) surpassing the 50 consultancy targets for the year.

Contract Research

ASTI developed the controller board device in conjunction with the requirements of Soniford Maeller Corporation's dental chair. The device can control the seat height and backrest inclination. This dental chair is now being manufactured and sold by Soniford, a local dental equipment company.

Access to Facilities

The Institute has been a favorite destination of engineering students from the different regions of the country. Not only students visited the institute but also IT specialists both local and foreign as well as ASTI's partners from the government, academe and industry. Visitors were toured to the four technical divisions and were able to see the technical staff doing their projects.

Students, teachers, engineers and researchers have frequently visited the library in order to have access to its wide collection of engineering and computer books, scientific journals and other periodicals.

ASTI also provided its facilities and equipments to the government, academe and industry for their projects and researchers.

S&T Promotion

As a means of promoting the R&D efforts of the Institute, ASTI actively participated in technology fairs and exhibitions. ASTI were able to showcase its programs and projects in the following exhibition: 2002 NSTW, e.SERVICES.Philippines, e-gobyerno, Independence Day exhibition

ASTI also disseminated printed materials like annual reports, brochures, press release, as well as do interviews and presentations of technical papers in both local and foreign conferences.

Finance and Human Resources Management

Finance

Summary of Allotment, Obligations, Balances (as of December 31, 2002)

DESCRIPTION	ALLOTMENT	OBLIGATIONS INCURRED	UNOBLIGATED ALLOTMENT/ BALANCES
Personal Services	13,493,721.06	13,355,746.28	137,974.78
Maintenance and other operating expenses	12,351,478.94	6,428,357.85	5,923,121.09
Capital Outlay (Cont. Approp.)	2,511,202.23	1,070,974.55	1,440,254.68
De-obligation of prepayments-per COA circular no. 99-004	1,103,607.36	1,103,607.36	-
Total	29,460,009.59	21,958,659.04	7,501,350.55

Staff Profile

ASTI is the smallest attached agency of the DOST in terms of manpower. Overall ASTI has 50 personnel as of December 31, 2002. There are 42 regular personnel and eight (8) contractual staff.

Of the 49 plantilla positions allocated to the Agency, 42 are filled up or 86% of the plantilla positions. Of this number 22 or 52% are technical staff and 20 are administrative personnel. All of the eight (8) contractual positions are filled up and occupied by technical personnel.

ASTI Staff is also complemented by DOST funded Projects. As of December 31, 2002, project staff totaled 35. Majority of the contractual staff are hired under the Projects implemented by the Agency under the COMPETE Program of the Department, in particular, the Virtual Centers for Technology Innovation (VCTI) in Microelectronics and VCTI in Information Technology.

Year 2002 shows that the number of female employees in ASTI comprises 41% of the total population.

In keeping with its mission to become a national center of excellence, ASTI keeps abreast of developments in its areas of interest through the pursuit of postgraduate education, attendance in trainings, conferences and seminars.

Staff Trainings

The following table illustrates the trainings participated in by ASTI staff:

Technical Trainings

Local

DATE	TITLE OF TRAINING/WORKSHOP/DEMO
February 13	Noise in Submicron Amps
April 12	NIPS Seminar
April	Training on Bitmapping
May 20-22	PI TMS320C54x Workshop for Realtime DSP
May 22-24	6th International Symposium on Parallel Architectures and Networking
July 4	NAST Symposium
July 9-11	Chip Synthesis workshop
July 17	Seminar on E-Procurement
July 18	CONNEXT
September 11	Telephony and Data Communications Seminar
August 27	Training on Accelerating Embedded Soft Ware Through Visual Modelling.
Sept 30-Oct 4	Software Engineering- Building Quality into SoftWare
Oct 4	Industry Seminar
Oct 4	Digital Certificate Forum
Oct 21-25	Openlab Training Series II – VLSI Design: Theory, Approaches, Tools and Applications
Nov 25-Dec 13	Microprocessor Laboratory Asian Course on Advanced VLSI Design Techniques Using a Hard Ware Description Language
Nov 27	ECE Conference
Nov 28-29	Orientation/Training on S&T Media Service Online Content Development and Management

International

DATE	TITLE OF TRAINING/WORKSHOP/DEMO	Organizer
Jan 22	E-commerce Roundtable Conference	JETRO
Feb 25-March 1	Turbo Codes: Analyses, Design Performance and Implementation in LA, California, USA	
March 26-30	R&D Management, Korea	Asian Productivity Organization
May 28 - June 7	CIO Training Programme on Strategic Management of IT	Singapore Ministry of Foreign Affairs

Non-Technical Trainings

DATE	TITLE OF TRAINING/WORKSHOP/DEMO
March 13	Conversational English
March 14	Public Speaking
March 15	Business Writing
March 26-30	R&D Management
April 15-19	Newsletter Writing & Production workshop
March 10-12	First Philippine Journalists Congress
June 11	5 S Seminar
August 20-21	Seminar-Workshop on Productivity-Based Budgeting for the Public Sector
August 27	Training on Accelerating Embedded Soft Ware Through Visual Modeling
Sept 30-Oct 4	Software Engineering- Building Quality into Software
Oct 22	Semiconductor and Electronics Industries of the Philippines, Inc (SEIPI) Forum
Nov 7-8	Human Resource Planning workshop
Nov 14	Executive Briefing on Knowledge Management Tools

AGENCY DIVISIONS

Office of the Director (OD)

OD oversees the welfare of the agency. It is involved in the planning and monitoring of research programs, collaborative activities within and outside ASTI, direction setting and provision of pertinent services to its technical divisions such as facilitating their partnerships with external agencies.

Under this division is the Business Development Unit (BDU) and the Project Management (PM) group. The BDU addresses the external needs of ASTI like developing a strategic marketing program for ASTI technologies, product engineering and prototyping, evaluating marketability of potential and existing technologies and policy advocacy, among others. The PM group looks into the internal aspects of the Institute like proposal generation, project planning, resource evaluation and allocation and organizational process improvement activities.

Finance and Administrative Division (FAD)

FAD provides general support and administrative services such as the management of the Institute's property, supply, financial, human resource and records. It also manages the agency's library of technical books, manuals, software, data books and leading technical journals and magazines.

Communications Engineering Division (CED)

CED seeks to contribute to the emergence and growth of the local communications engineering industry through research and development in communications engineering and its applications for the industry, government, and society. Its efforts include the development of systems for broadband wireless networks with focus on error correction coding, digital signal processing, RF/microwave circuit design, 802.11, GPS and other wireless platforms; development of system platforms and device drivers for embedded systems supporting data, audio and video applications; and establishment of PREGINET- a national research and education network envisioned to bridge the digital divide between urban and rural communities, to increase competence in S&T capabilities and to promote better delivery of services and information. PREGINET also conducts research, testing and deployment of networking technologies and services essential for the continuing evolution of the Internet.

Computer Software Division (CSD)

The Computer Software Division aims to be one of the leading research groups in the Philippines in the general area of networked applications development. The group currently engages in developmental work on Bluetooth technology and Open Source based applications. Our research areas are in mobile java based applications, server-based computing, and distributed programming. Our long term goal is to make strong positive contributions to national development by providing solutions for government and SMEs and to provide development platforms for the local software industry.

Another group in CSD is the Management Information Systems (MIS) Group responsible for the maintenance and optimization of ASTI's IT infrastructure. It is also in charge of the procurement, allocation, monitoring and repair of ASTI's computing resources as well as the evaluation, design, development, implementation, and documentation of ASTI's information systems.

Microelectronics Division (MED)

MED aims to catalyze advancements in microelectronics research by developing world-class design capabilities to promote a culture of technology awareness and to encourage active involvement from the academe, government RDIs, industry and other sectors. Its R&D efforts are focused on the COMPETE-Microelectronics Program, whose major activities involve managing a state-of-the-art design laboratory - ASTI-VCTI Open Laboratory, and establishing the design foundation and know-how vital for the Philippines to enter the global market for integrated circuits.

The group has been realizing its goals through the organization of various trainings and seminars to further enhance the skills of the country's pool of IC designers. Aside from these trainings and seminars, the group has been continually collaborating with other government agencies, the industry and the academe to upgrade the capability of Filipino engineers and to address the needs of the local electronics industry.

Special Projects Division (SPD)

SPD bridges the researches done at ASTI with the needs of the market. It does this by leveraging on the technologies and capabilities developed at ASTI and matching these with the requirements of its customers and clients.

It is composed of the following teams: Systems Engineering Group (SEG). Embedded Systems Group, and the Printed Circuit Board (PCB) Team.

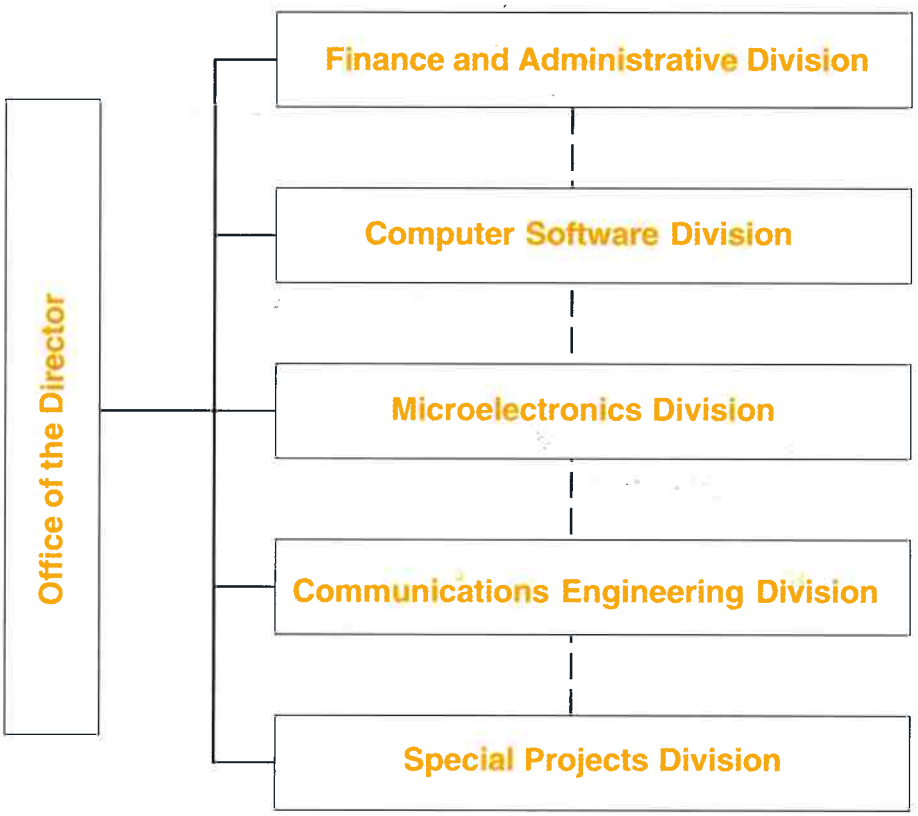
The Systems Development Group and the Embedded Group develops product prototypes based on ASTI technologies. The team's composition leverages on the diverse technical capabilities of ASTI's researchers. The

Systems Development Group is responsible for translating user/customer requirements into an optimized system architecture. This system architecture then serves as the blueprint that the Embedded group will use to make a detailed design.

The Embedded Systems Group was formed to address the growing needs in embedded software and hardware design. The group is working on real-time operating system evaluation on different hardware platforms, system protocol and platform design and development, all of which are necessary to develop an embedded product.

The PCB team provides PCB layout design and fabrication services to ASTI's technical divisions. It also conducts its own particular form of research to enhance its capabilities in the services it offers. With a vision to provide support and spur development of the local electronics industry to be competitive with international standards, SPD offers its PCB layout design and fabrication services as well as conducts trainings on designing electronic devices to the industry and academe.

ASTI Organizational Chart



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